

GHOST CITRUS GROVES

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The Division of Plant Industry evaluates prospective soil pit sites in Florida to insure that soil dug from such sites does not harbor serious nematode pests of citrus such as the burrowing nematode (Radopholus similis (Cobb, 1893) Thorne, 1949), the citrus nematode (Tylenchulus semipenetrans Cobb, 1913), or the coffee lesion nematode (Pratylenchus coffeae (Zimmerman, 1898) Filipjev & Schuurmans Stekhoven, 1941). In 1980-82, for example, 831 soil pit sites were evaluated, 599 of which were disapproved due to the presence of nematode pests that pose a threat to citrus plantings or to conditions favoring the presence of such pests. When such sites are evaluated, they are surveyed to insure that citrus plantings present or past are not present in the environs.

In 1985 a soil pit site was evaluated by the authors in Marion County. Entry into the environs revealed what might appear to the inexperienced eye as a very ordinary oak forest. A closer look, however, revealed laurel oak (Quercus laurifolia Michx.) growing in orderly rows (Fig. 1, top) in a spacing of about 20 x 25 feet. Each tree site was represented by one to three oak trees growing closely together. What lay before our eyes was a grove of oak trees very likely sowed by birds which had been dining on acorns in the branches of dead and dying citrus trees. One could easily visualize row upon row of the citrus trees which had been growing on that site, now a "ghost grove" replaced by oaks.

Due to its northern location and the age of the oak trees, it was estimated that the citrus grove had been in existence 40-50 years ago. Very likely, the grove was destroyed in one of the record cold waves that occur in Florida at all too frequent intervals.

A second ghost grove site was visited near Minneola, Florida. In this site a few large laurel oaks were observed in a pasture in a citrus grove spacing (Fig. 1, bottom). Down the road about one-half mile was another ghost grove comprised of laurel oaks very similar to the grove in Marion County. The oak trees in this site appeared in a grove pattern in an aerial photograph. These groves were planted in 1958, damaged by cold in 1960 and 1962, replanted, and finally abandoned in 1968. A visit to a fourth site near Okahumpka revealed a recent transition from abandoned grove to laurel oak. The grove at this site was planted in 1923, and poorly maintained until 1982, at which time it went out of production. Laurel oaks were growing from the bases of a number of dead citrus trees at this site, and one dead citrus tree had an oak and a cherry tree emerging from its base (Fig. 2-A). A young oak tree about 4 feet high growing from a dead citrus tree (Fig. 2-B) provided evidence of the oak succession.

The earliest records of citrus cultivation in Florida were in the late 1500's, generally wherever Spanish settlements sprang up, including the more northerly areas along the Gulf Coast. Here, man converted the natural woodlands to cultivated citrus groves. Because of abandonment following natural catastrophies or for other reasons, many citrus groves disappeared and again reverted to their natural woodlands with oak trees predominating. This succession continues even today. A search for ghost groves would probably reveal the terrible consequences of freezes, particu-

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larly in north Florida. The severe freeze of 1835 and the two devastating freezes of 1894-95 and 1899 resulted in the entire abandonment of the northern sections for commercial citrus production. It is too early to predict the fate of trees devastated by the 1983 and 1985 Florida freezes, but let us hope for minimal appearance of ghost groves.

Trees from these sites, either native or citrus, failed to reveal any regulatory plant parasitic nematodes (Table 1), and native trees are non-hosts of any of these regulatory nematodes. Knowing the longevity of nematodes is important in determining how long a quarantine should last, especially in the case of ghost groves. Survival of the burrowing nematode is only six months in host free soil (4) and, for the coffee lesion nematode, four months at temperatures above 85° F (2). The citrus nematode was reported to survive 31 months in a field free of citrus roots (1), and only 18 months in another study under dry-fallow conditions (3). Despite the fact that it is almost impossible to free a ghost grove site of alternate hosts of regulatory nematode pests of citrus, indications are that such nematodes would survive ghost grove conditions with difficulty. We would appreciate knowing the location of other ghost grove sites in Florida so we can accumulate additional survey data for use in future site approval evaluations.

LITERATURE CITED:

1. Hannon, C. I. 1964. Longevity of the citrus-root nematode in Florida. Proc. Soil & Crop Sci. Soc. Fla. 24:158-161.
2. Radewald, J. D., J. H. O'Bannon, and A. T. Tomerlin. 1971. Temperature effects on reproduction and pathogenicity of *Pratylenchus coffeae* and survival of *P. coffeae* in roots of *Citrus jambhiri*. J. Nematol. 3:390-394.
3. Reynolds, H. W., J. H. O'Bannon, A. T. Tomerlin, E. L. Nigh, Jr., and D. R. Rodney. 1970. The influence of various ecological factors on survival of *Tylenchulus semipenetrans*. Proc. Soil & Crop Sci. Soc. Fla. 30:366-370.
4. Tarjan, A. C. 1961. Longevity of *Radopholus similis* (Cobb) in host-free soil. Nematologica 6:170-175.

Table 1. Nematodes detected at the ghost grove sites.

Nematode	Ghost Grove Sites			
	Site-1 (oak) Marion County (Fig. 1-A)	Site-2 (oak) Lake County (Fig. 1-B)	Site-3 (oak) Lake County	Site-4 (mixed trees) Lake County Transition (Fig. 2-A, B)
<i>Belonolaimus</i> sp.	0	0	Present	0
<i>Cricemoides</i> sp.	Present	Present	Present	Present
<i>Hemicyclophora</i> sp.	Present	0	Present	0
<i>Hoplolaimus galeatus</i> (Cobb, 1913) Filipjev, Schuurmans Stekhoven, 1941	0	Present	Present	0
<i>Hoplolaimus tylenchiformis</i> Daday, 1905	0	Present	0	0
<i>Meloidogyne</i> sp.	0	0	0	Present
<i>Pratylenchus brachyurus</i> (Godfrey, 1929) Filipjev Schuurmans Stekhoven, 1941	0	Present	0	0
<i>Xiphinema</i> sp.	0	0	0	Present



Fig. 1, top. Ghost grove site in Marion County. Citrus trees have been replaced by laurel oaks. Bottom, laurel oaks in grove conformation in a Lake County pasture.



Fig. 2, left. Laurel oak and a cherry tree emerging from the base of a dead citrus tree. Right, a young oak tree emerging from the base of a dead citrus tree.